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A Summary of Global Immunization Coverage through 2013

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for the WHO and UNICEF working group for monitoring national immunization coverage

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A Summary of Global Immunization Coverage through 2013

Abstract: This paper summarizes the 2013 revision (completed July 2014) of the WHO and UNICEF estimates of national immunization coverage (WUENIC). Globally, coverage for the third dose of DTP containing vaccine (DTP₃) was 84% during 2013 with an estimated 111.8 million children vaccinated, an increase from 73% and 89.2 million children vaccinated during 2000; Coverage with the first dose of measles containing vaccine (MCV₁) was 84% during 2013, an increase from 73% during 2000. Among 49 countries in sub-Saharan Africa, 18 countries attained DTP₃ coverage levels $\geq 90\%$ and 14 countries attained MCV₁ coverage $\geq 90\%$ during 2013. Seven sub-Saharan African countries maintained DTP₃ coverage levels $\geq 90\%$ each year since 2005. Although there have been enormous and increasingly successful efforts to address the global burden of vaccine preventable diseases and to improve immunization coverage, an estimated 21.6 million children were unimmunized with DTP₃ globally during 2013.

Key words: vaccination, vaccination coverage, immunization, immunization coverage, monitoring, statistics

The annual collection and review of national immunization coverage data plays an important role in further reducing the morbidity, disability and mortality associated with vaccine preventable diseases and is critical to evaluating progress within the Decade of Vaccines initiative and the Global Vaccine Action Plan, which calls for national vaccination coverage of at least 90% and at least 80% vaccination coverage in every district or equivalent administrative unit for all vaccines in a country's national immunization schedule [1]. Each year since 2000, the United Nations Children's Fund (UNICEF) and the World Health Organization (WHO) have jointly reviewed, prepared and published estimates of national immunization coverage for selected vaccine preventable diseases. This paper summarizes the 2013 revision (completed July 2014) of the WHO and UNICEF estimates of national immunization coverage (WUENIC) made for 195 countries or territories.

Methods

Among other recommendations, the WHO recommends that all children receive three doses of diphtheria–tetanus–pertussis containing vaccine (DTP), three doses of polio vaccine (either oral polio vaccine or inactivated polio vaccine), a dose of Hepatitis B vaccine (HepB) delivered within 24 hours of birth followed by three additional doses of HepB, three doses of *Haemophilus influenzae* type B vaccine (Hib) and at least one dose of a measles containing vaccine (MCV) [2]. One dose of Bacille Calmette-Guérin vaccine (BCG) against tuberculosis is recommended for children living in countries with a high-disease burden and for high-risk children living in countries with low-disease burden (currently 160 countries administer BCG at birth) [2]. The WHO also recommends pneumococcal conjugate vaccine (PcV) and rotavirus vaccine as part of a comprehensive strategy to control pneumonia and diarrhoeal disease, respectively [2].

Each year WHO and UNICEF jointly review reports by national authorities regarding national immunization coverage for these and other antigens as well as survey data from the published and grey literature. Based on these data, with due consideration to potential biases and the views of local experts (primarily national immunization system managers and

WHO/UNICEF regional and national staff), WHO and UNICEF attempt to distinguish between situations where the available empirical data accurately reflect immunization system performance and those where the data are likely to be compromised and present a misleading view of immunization coverage while jointly estimating the most likely immunization coverage levels for each country or territory.

The WUENIC are country-specific; that is to say, each country's data are reviewed individually, and data are not borrowed from other countries in the absence of data. The WUENIC are not based on *ad hoc* adjustments to reported data; in some instances empirical data are available from a single source, usually the nationally reported coverage data to WHO or UNICEF. In cases where no data are available for a given country–vaccine–year combination, data are considered from earlier and later years and interpolated to estimate coverage for the missing year(s). In cases where data sources are mixed and show large variation, an attempt is made to identify the most likely estimate with consideration of the possible biases in the available data. Finally, the WUENIC, while informed by data from national authorities, constitute an independent technical assessment by WHO and UNICEF of national routine immunization system performance. A detailed explanation of the WUENIC estimation methods is provided elsewhere [3,4]. Country-specific coverage data are available online at data.unicef.org/child-health/immunization and www.who.int/immunization_monitoring/data/en/index.html.

In this report, we present data on global and regional coverage for BCG, hepatitis B birth dose (HepBB), first and third dose of DTP containing vaccine (DTP₁, DTP₃), third dose of HepB vaccine (HepB₃), third dose of Hib vaccine (Hib₃), third dose of polio vaccine (Pol₃), third dose of PcV vaccine (PcV₃), last dose of rotavirus vaccine as well as the first dose of MCV during 2013. Decennial estimates from 1980 are reported for all vaccines except HepBB, HepB₃, Hib₃, PcV₃ and rotavirus vaccines which were introduced at later times and for which reporting started after 1990. We also report the estimated number of children who did not receive three doses of DTP containing vaccine and the estimated number of children who did not receive MCV₁.

Immunization coverage levels are presented as the percentage of a target population that has been vaccinated. For example, DTP₃ coverage is calculated by dividing the number of children receiving the third dose of DTP containing vaccine by the number of children who survived to their first birthday. To the extent possible, the WUENIC refer to immunizations given during routine immunization services to children less than 12 months of age — with the exception of BCG and HepBB for which the target population is live births — where such services are recorded; supplementary immunization activities such as polio, tetanus and measles campaigns are not included to the extent possible.

Global and regional (Millennium Development Goal regions) averages are obtained by multiplying the country-specific coverage and a target population weight for each country where the weight is equal to the country-specific number of children in the target population (number of births for BCG and HepBB, number of births surviving to their first birthday for all other vaccines) divided by the sum of the children in the target population across all countries either globally or regionally. The estimated number of births and surviving infants for each country is obtained from the United Nations Population Division [5]. The number of children unreached with DTP₃ is obtained by multiplying the proportion not vaccinated ($1 - \text{coverage level}$; e.g., 0.85) for each country and the estimated number of surviving infants for each country obtained from the United Nations Population Division.

Results

Global and MDG regional average coverage for HepBB, BCG, DTP₁, DTP₃, HepB₃, Hib₃, Pol₃, PCV₃, last dose of rotavirus vaccine and MCV₁ during 2013 are shown in **Table 1**. Globally, DTP₃ coverage was 84% during 2013, an increase from 73% during 2000. Similarly, global MCV₁ coverage increased from 73% during 2000 to 84% during 2013. During 2013, an estimated 111.8 million children were vaccinated with three doses of DTP containing vaccine (estimated 89.2 million children vaccinated during 2000); 21.8 million children were unvaccinated with three doses of DTP containing vaccine (estimated 32.8 million unvaccinated during 2000). Given an estimated annual cohort of 133.6 million surviving

infants, an additional 11.2 million children would need to have been reached during 2013 to attain 90% DTP₃ coverage globally. The estimated number of additional children to reach 90% DTP₃ coverage during 2013 was 5.2 million in sub-Saharan Africa and 5 million in Southern Asia (**Figure 1**). Globally, an estimated 21.6 million children were not reached with MCV₁ with an additional 8.3 million children needing to be reached to attain 90% MCV₁ coverage worldwide.

Among 195 countries or territories, coverage during 2013 was $\geq 90\%$ in 130 countries for DTP₃ and in 129 countries for MCV₁. Among 33 countries in Latin America and the Caribbean, coverage during 2013 was $\geq 90\%$ in 21 countries for DTP₃ and in 26 countries for MCV₁. Among 49 countries in sub-Saharan Africa, 18 countries attained DTP₃ coverage levels $\geq 90\%$ and 14 countries attained MCV₁ coverage $\geq 90\%$ during 2012. Fifty-one of 195 countries or territories—accounting for less than one-fifth of the global birth cohort—maintained DTP₃ coverage levels $\geq 90\%$ each year since 2005.

Coverage with three doses of HepB vaccine during 2013, which had been introduced nationally in 184 countries or territories, was 81% globally. Similarly, coverage with three doses of Hib vaccine, which had been introduced in 187 countries or territories by 2013, was 52% globally and ranged from $<10\%$ in Eastern Asia (where only Mongolia has included the vaccine in its national immunization schedule) to 97% in the Caucasus & Central Asia. A total of 101 countries or territories had introduced PcV by 2013 (global coverage during 2013 for PcV₃, 25%), and rotavirus vaccine had been introduced in 50 countries by 2013 (global coverage during 2013 for rotavirus vaccine, 14%). (NB: The State of Palestine maintains observer status within the World Health Assembly; as such, official reports from the WHO on Member States of the WHA may differ in terms of the number of countries that have introduced HepB [183 countries], Hib [186 countries] and PcV [100 countries] vaccines nationally. Data on vaccine introduction can be obtained from www.who.int/immunization/monitoring_surveillance/data).

Improvements in coverage levels were observed among the countries classified as least developed countries (note: least developed country classification based on 2014

classifications used by the United Nations in the World Economic Social Survey, available online at www.un.org/en/development/desa/policy/wess/ ; there is no established convention for the designation of “developed”, “developing”, “least developed” countries or areas in the United Nations system). Among 49 countries classified least developed for 2013, 18 countries attained $\geq 90\%$ DTP₃ coverage (regional average DTP₃ coverage in 2013, 80%) compared to nine countries (Bangladesh, Bhutan, Eritrea, The Gambia, Malawi, Rwanda, Sao Tome and Principe, Tuvalu, Tanzania) during 2005 (regional average DTP₃ coverage in 2005, 71%) and to three countries (Bhutan, Kiribati and Rwanda) during 2000 (regional average DTP₃ coverage in 2000, 58%). Similarly, 12 of 49 least developed countries reached 90% MCV₁ coverage (regional average MCV₁ coverage in 2013, 79%) during 2013 compared to only one country (Samoa) during 2000 (regional average MCV₁ coverage in 2000, 57%). Unfortunately, progress in the least developed countries continued to lag behind that of the developed countries, with 2013 coverage levels for DTP₃ and MCV₁ in the least developed countries at levels achieved between 1985–1990 in countries currently classified as developed economies.

Comment

As the WUENIC are updated annually and incorporate new empirical data including revisions to previous administrative and/or government official coverage reports and new survey results [3,4], each annual revision of the WHO and UNICEF estimates supersedes prior data releases. In countries where national immunization coverage surveys (e.g., Demographic and Health Surveys or Multiple Indicator Cluster Surveys) are frequently conducted thereby influencing the availability of empirical data that serve as inputs to the WHO and UNICEF estimates, between-revision changes in WUENIC are therefore possible. It is also important to note that within a given WUENIC revision, year-to-year changes at global, regional and national levels may or may not suggest meaningful differences in coverage levels and occur against a backdrop of long-term increases in coverage levels. Changes in WUENIC between revisions may reflect either a change in empirical data or a true change in

immunization programme performance. At national levels, fluctuations in WUENIC (within a given revision) typically represent new leadership, stock-outs, changes in donor support, or shocks to the immunization delivery or health system more broadly (e.g., conflict, natural disasters, decentralization). WHO and UNICEF do not produce sub-national coverage estimates. Coverage at the national level may mask heterogeneity at sub-national levels. Recognizing the importance of the underlying quality of empirical data used to manage immunization programmes, WHO, UNICEF and partners are working with national immunization programmes to address problems in recording and monitoring of the number of children vaccinated (e.g., through data quality self-assessments) as well as in the underlying target population estimates.

In summary, the annual collection and review of national immunization coverage data plays an important role in further reducing the morbidity, disability and mortality associated with vaccine preventable diseases and is critical to evaluating progress forward. The benefits of vaccination continue to reach more children each year; unfortunately, these benefits elude many of the world's children. The results here suggest much work remains to reach coverage levels of at least 90% at national levels in all countries [1]. While global coverage with three doses of DTP as well as measles containing vaccines has improved greatly since the 1980s, improvements at the global level since 2000 have been more modest. Opportunities remain to improve the reach of immunization services with existing vaccines while continuing the introduction of new vaccines. As noted by the Decade of Vaccines Collaboration Leadership Council, an unprecedented opportunity exists to extend the full benefits of immunization to all people through universal access to appropriate vaccines [1]. UNICEF and WHO, along with other partners in the GAVI Alliance (www.gavialliance.org), continue to work with governments to ensure appropriate commitment, investment and coordinated and coherent action is taken to improve routine immunization programmes in order to have maximal impact on children's lives.

Conflict of Interest

None to declare.

Acknowledgments

None to declare.

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TABLE 1. WHO and UNICEF estimates of national routine immunization coverage (%) for select antigens by Millennium Development Goal (MDG) region: 1980 – 2013

MDG Region*	BCG						HepBB**				DTP ₁					
	1980	1990	2000	2005	2010	2013	2000	2005	2010	2013	1980	1990	2000	2005	2010	2013
Sub-Saharan Africa	<10	73	68	74	82	82	<10	<10	<10	<10	<10	76	66	73	81	82
Northern Africa	26	93	97	98	98	98	<10	24	35	34	39	95	97	97	98	98
Western Asia	22	93	92	87	91	90	17	76	63	64	51	94	92	91	94	89
Caucasus & Central Asia	—	—	96	89	98	98	22	97	79	98	—	—	95	96	98	98
Eastern Asia	<10	98	84	86	99	99	<10	84	90	94	<10	98	93	95	99	99
South-Eastern Asia	45	84	88	88	89	95	12	11	21	27	24	89	89	88	93	95
Southern Asia	<10	71	76	81	88	88	<10	<10	14	27	24	86	81	86	89	88
Oceania	65	91	83	76	81	88	<10	17	40	44	60	97	86	82	83	89
Caribbean	36	80	85	88	91	92	20	46	42	41	53	84	87	90	92	91
Latin America	54	79	97	97	96	94	40	50	73	75	61	86	97	97	97	95
Developed	20	83	92	91	94	93	<10	27	30	33	75	91	97	98	96	98
Global	16	81	80	83	90	90	<10	25	33	38	30	88	84	87	91	91

continued.

MDG Region*	DTP ₃						HepB ₃ [†]					Hib ₃ [†]				
	1980	1990	2000	2005	2010	2013	1990	2000	2005	2010	2013	1990	2000	2005	2010	2013
Sub-Saharan Africa	<10	56	52	62	72	74	—	<10	39	70	75	—	<10	17	60	72
Northern Africa	28	87	95	96	97	97	—	68	94	97	97	—	—	<10	44	50
Western Asia	28	86	85	84	89	83	10	68	84	89	86	—	<10	39	73	83
Caucasus & Central Asia	—	—	93	94	96	97	—	23	90	96	97	—	—	—	83	97
Eastern Asia	<10	96	85	87	99	99	—	60	85	99	99	—	—	<10	<10	<10
South-Eastern Asia	16	75	81	81	85	85	<10	41	67	85	84	—	—	<10	17	44
Southern Asia	<10	68	63	72	77	76	—	<10	23	52	72	—	—	—	22	36
Oceania	37	74	65	66	63	72	18	64	67	63	72	—	10	10	61	72
Caribbean	32	68	73	79	82	81	—	41	58	55	80	—	23	57	54	78
Latin America	37	68	92	94	94	89	—	68	91	93	89	—	72	94	93	89
Developed	69	83	93	96	94	95	—	50	70	73	74	—	62	67	71	78
Global	20	76	73	78	84	84	<10	30	55	74	81	—	14	21	42	52

continued.

MDG Region*	Pol ₃						MCV ₁						PcV ₃		Rotavirus	
	1980	1990	2000	2005	2010	2013	1980	1990	2000	2005	2010	2013	2010	2013	2010	2013
Sub-Saharan Africa	<10	56	54	65	74	76	<10	56	53	61	74	74	<10	35	<10	15
Northern Africa	32	87	95	96	97	97	21	84	93	94	96	96	<10	15	<10	17
Western Asia	37	86	86	86	89	85	17	79	86	84	87	83	43	58	<10	33
Caucasus & Central Asia	—	—	94	94	95	98	—	—	93	94	97	97	—	16	—	<10
Eastern Asia	<10	97	87	87	99	99	<10	98	84	87	99	99	—	—	—	—
South-Eastern Asia	12	75	80	86	85	88	<10	70	82	85	84	89	—	—	—	<10
Southern Asia	<10	65	63	64	75	74	<10	57	62	65	76	76	—	<10	—	—
Oceania	32	74	56	58	67	73	<10	70	67	66	60	73	<10	<10	<10	<10
Caribbean	45	74	73	80	82	80	20	64	77	76	78	79	<10	<10	—	22
Latin America	61	70	93	93	94	89	43	77	95	94	94	92	37	76	71	77
Developed	68	85	94	95	94	95	63	84	92	93	92	93	52	55	20	24
Global	21	76	74	77	84	84	16	73	73	76	84	84	11	25	<10	14

Source: WHO and UNICEF estimates of national routine immunization coverage, 2013 data revision (July 2014)

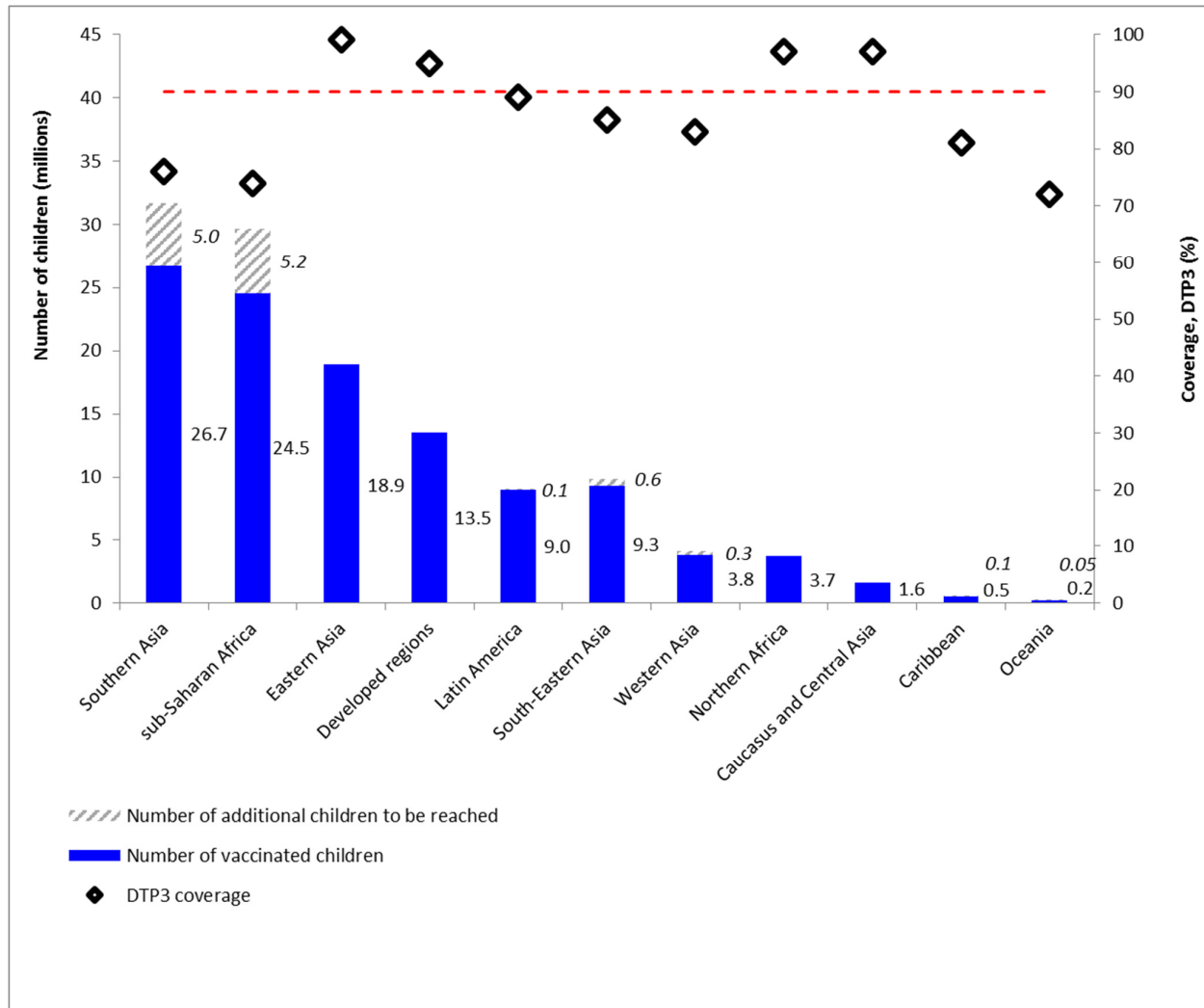
BCG, bacille Calmette-Guérin vaccine; HepBB, Hepatitis B birth dose; DTP₁, first dose of diphtheria–tetanus–pertussis containing vaccine; DTP₃, third dose of diphtheria–tetanus–pertussis containing vaccine; Pol₃, third dose of polio vaccine; Hib₃, third dose of *Haemophilus influenzae* type B vaccine; HepB₃, third dose of hepatitis B vaccine; MCV₁, first dose of measles containing vaccine; PcV₃, third dose of pneumococcal conjugate vaccine; Rotavirus, last dose of rotavirus vaccine

* Millennium Development Goal (MDG) region, available at <http://www.un.org/millenniumgoals/index.shtml>

** HepBB coverage was universally recommended by the WHO in 2009. During 2013, WHO and UNICEF estimate HepBB coverage for 195 countries or territories.

† Note that HepB and Hib vaccine were introduced in 1982 and 1986, respectively.

FIGURE 1. Coverage levels with three doses of DTP containing vaccine (DTP₃), estimated number of children vaccinated with DTP₃, and estimated number of *additional* children that would need to be vaccinated to reach 90% coverage with DTP₃ within each region during 2013, by Millennium Development Goal region



Source: WHO and UNICEF estimates of national routine immunization coverage, 2013 data revision (July 2014); United Nations, Department of Economic and Social Affairs, Population Division (2013). *World Population Prospects: The 2012 Revision*.